



SINGAPORE'S NATIONAL SCIENCE EXPERIMENT 2016

Step up for Science!

Organisers



Partners



Technology Sponsors



Logistics Sponsor



In celebration of



Agenda

- NSE 2015 Big Data Visuals
- NSE 2015 National-level and School-Level analysis
- NSE2016 Programme and Plan
 - New Experiments for NSE2016
 - Administrative matters: Registration, delivery, distribution
- Curriculum package
- Sharing session (Hong Kah Secondary school)
- QnA

Post briefing

- Curriculum package demo
- Distribution of SENSG and school data (for eligible schools)

The National Science Experiment

A nation-wide project to engage students in STEM, launched by President Tony Tan in Jan 2015

B14 | HOME

SATURDAY, JANUARY 24, 2015

THE STRAITS TIMES

Science experiment to involve over 250,000 students

Joint project will entail monitoring them via a personally-issued device

By FENG ZENGKUN

SINGAPORE is about to embark on a large-scale national science experiment involving more than 250,000 students over the next three years.

The students, comprising those in primary 4 to secondary 3, will each be given a pocket device each to carry with them for a few days each year. The device, loaded with an array of sensors, will be used to track how many steps they take each day, how much time they spend outdoors, the areas they frequent and even measure levels of light or other data in the environment.

The information will be put online without any identifying details so that the students can analyse and draw conclusions about science and technology. The Science Centre Singapore will also create experiments schools can carry out with the devices, and they can compare with their own at school.

The project, as part of the country's push to spark young people's interest in science and technology, is set to officially start in the second half of the year.

Speaking at the closing ceremony of the Global Young Scientists Forum yesterday, President Tony Tan Keng Yam said: "This will probably be the most extensive, large-scale experiment we have ever conducted."

"Our students will learn how science and technology can be used to provide betterment and their lifestyles," he said, adding that the students will also be encouraged to participate in science fairs and competitions.

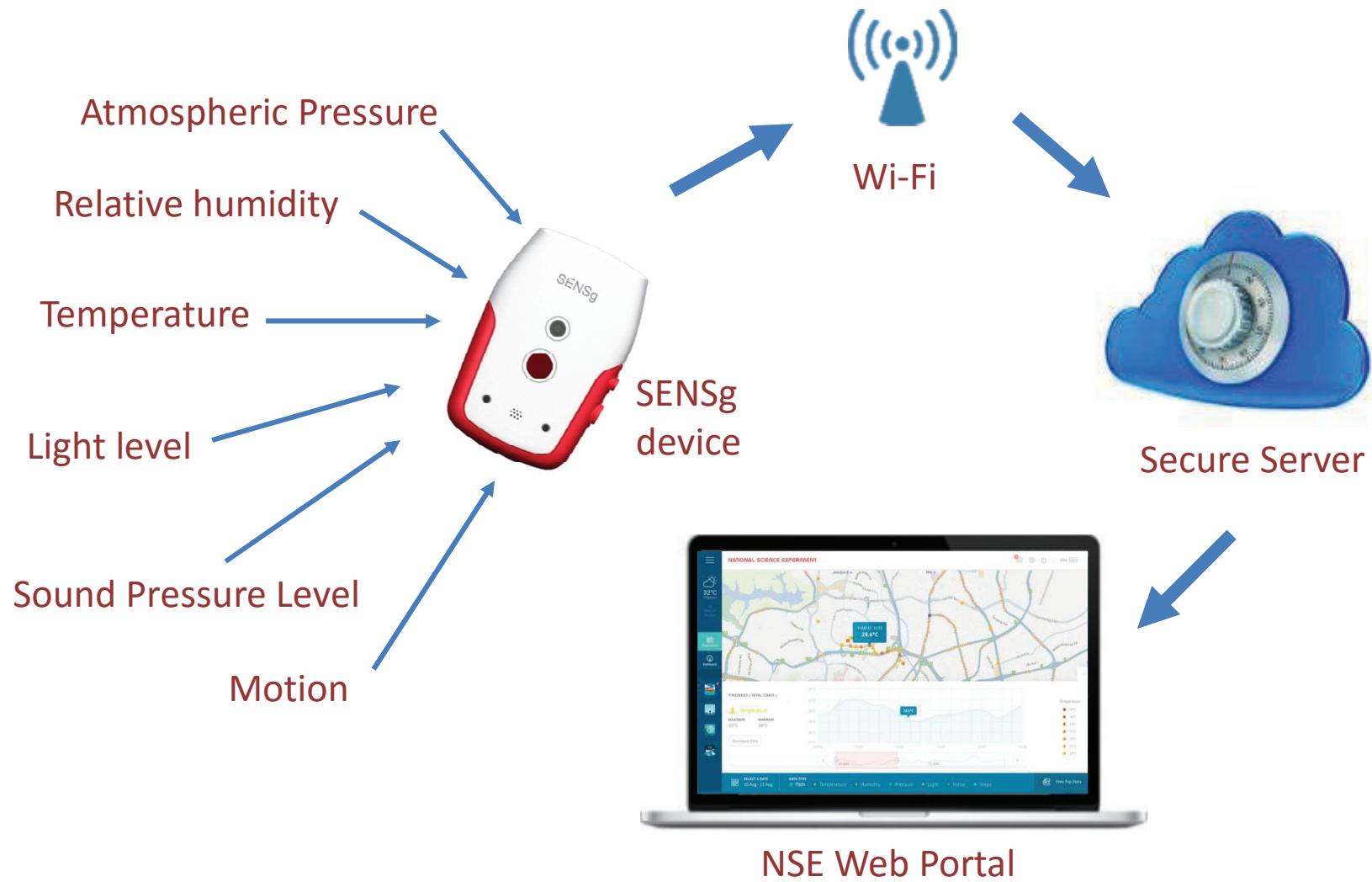
The initiative will also help the Republic to become a smart nation that uses technology to monitor what and where our citizens are going.

Each year's experiments and objectives will be different. This year, the goal is to encourage students to be more physically active. Next year, they will also be encouraged to use a camera on the device to take photos of their favourite places. This will allow them to identify similar places around the world in Singapore.

The project is a joint effort by the Ministry of Education, National Research Foundation, Singtel

Inculcate a **passion for science, R&D and innovation** among our students through a mass participation experiment, exposing students to **scientific concepts**, and generating **maps** on Singapore's urban outdoor environment

SENSg: Lab on a Lanyard



NSE2015 BIG DATA VISUALS

NSE2015 Montage



NSE2015 STEM



NSE2015 Results



NSE 2015 NATIONAL-LEVEL AND SCHOOL-LEVEL ANALYSIS

2015 Statistics

43,140 students

128 schools

0.5 Billion steps taken

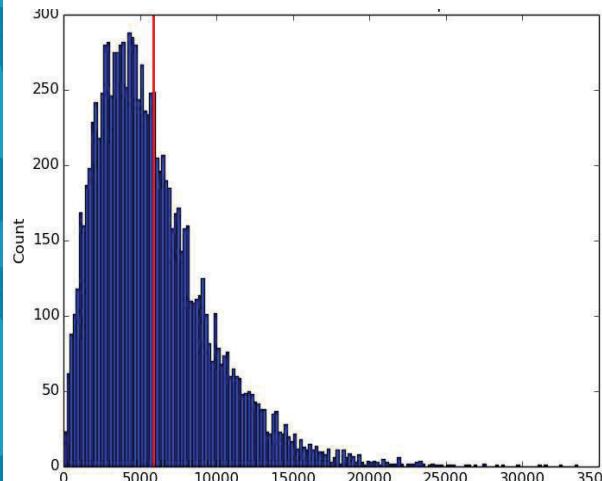
155,843 km per day

206,739 page views

2,742 hours of portal use

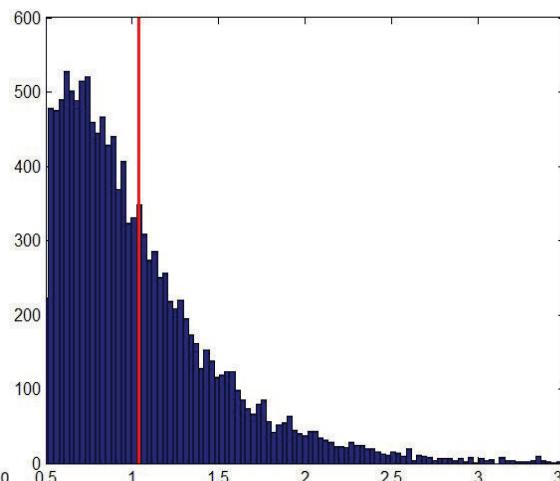
“Step out for Science” - Analysis

Steps/
day



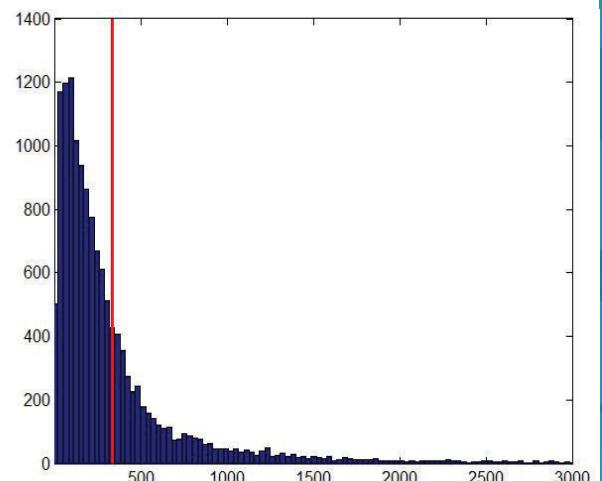
Mean steps:
5,853

Time spent
outdoors



Mean hours:
1.1

Carbon
Footprint

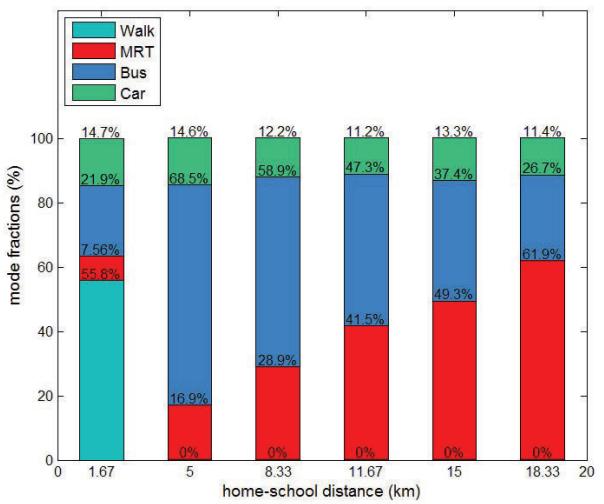


Mean
grams/student/day:
333

The three main questions for the 2015 National Science Experiment ‘Step Out for Science’ were answered using on-board intelligence developed by the SUTD.

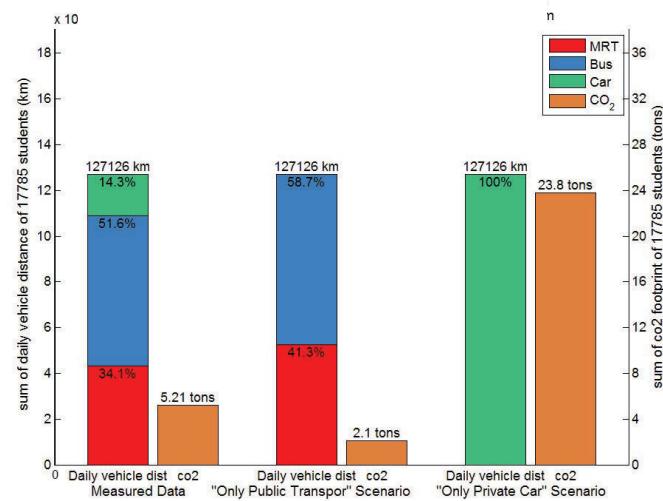
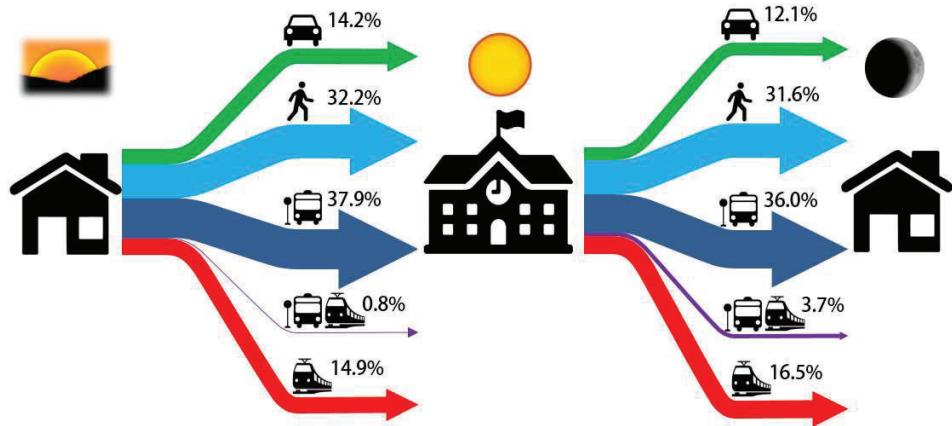
Transportation Mode Analysis

Over the course of the experiment, students travelled over 155,000 km daily to reach their schools. They tended to travel by road in the morning, and rail in the evening. More than 85% of student travel to school is by public transport.



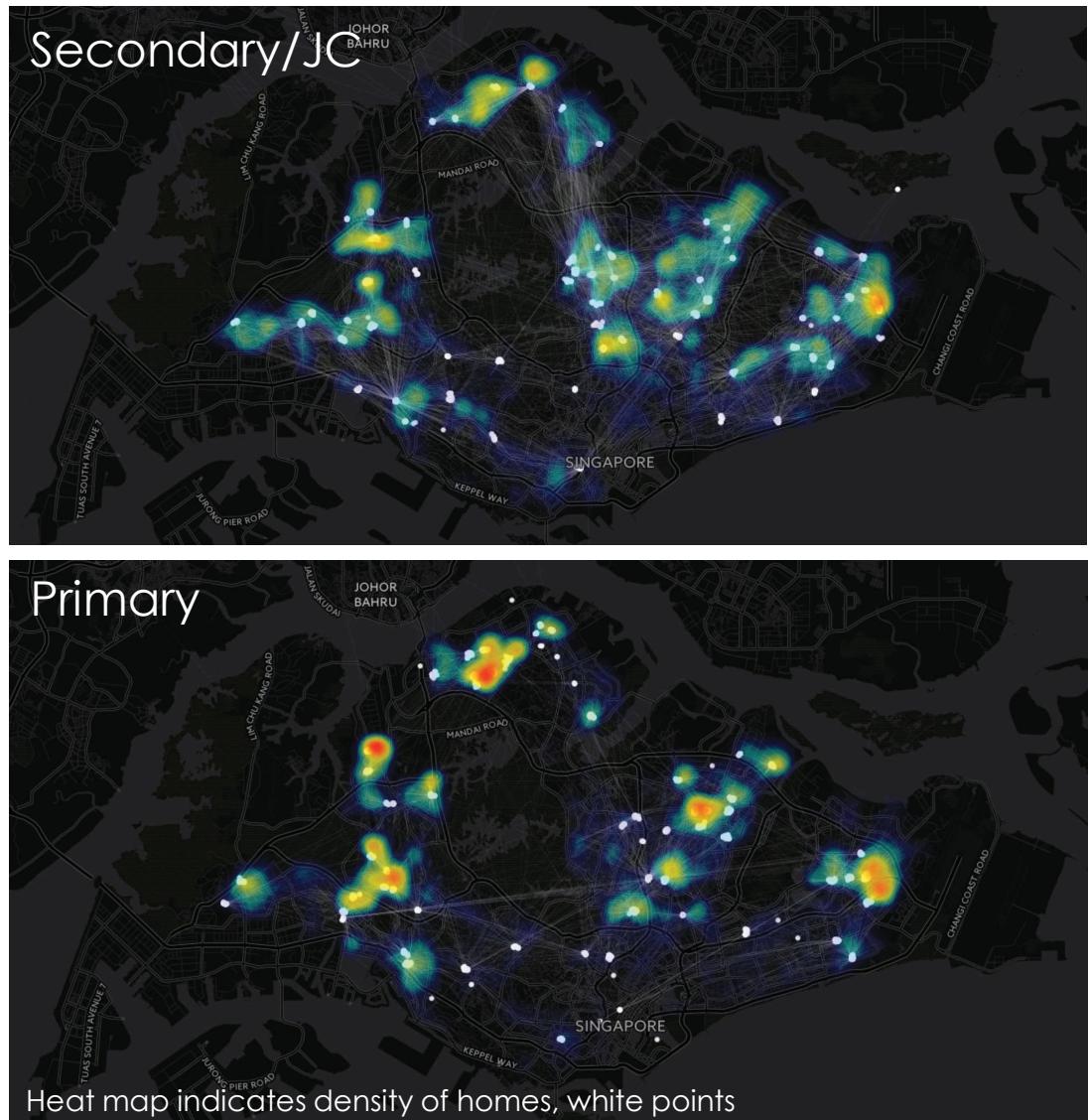
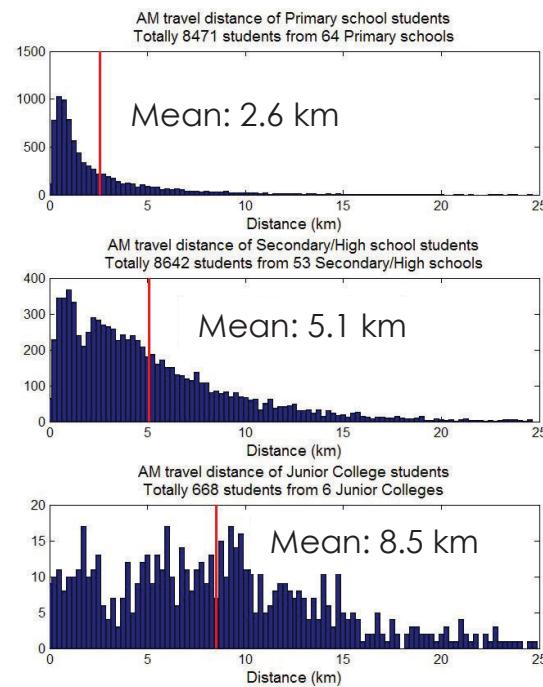
The further you live from school, the more likely it is that you take the train. Most students walk to school if they live within 2km.

Removing car travel entirely would halve CO₂ emissions, travelling exclusively by car would result in five times more.

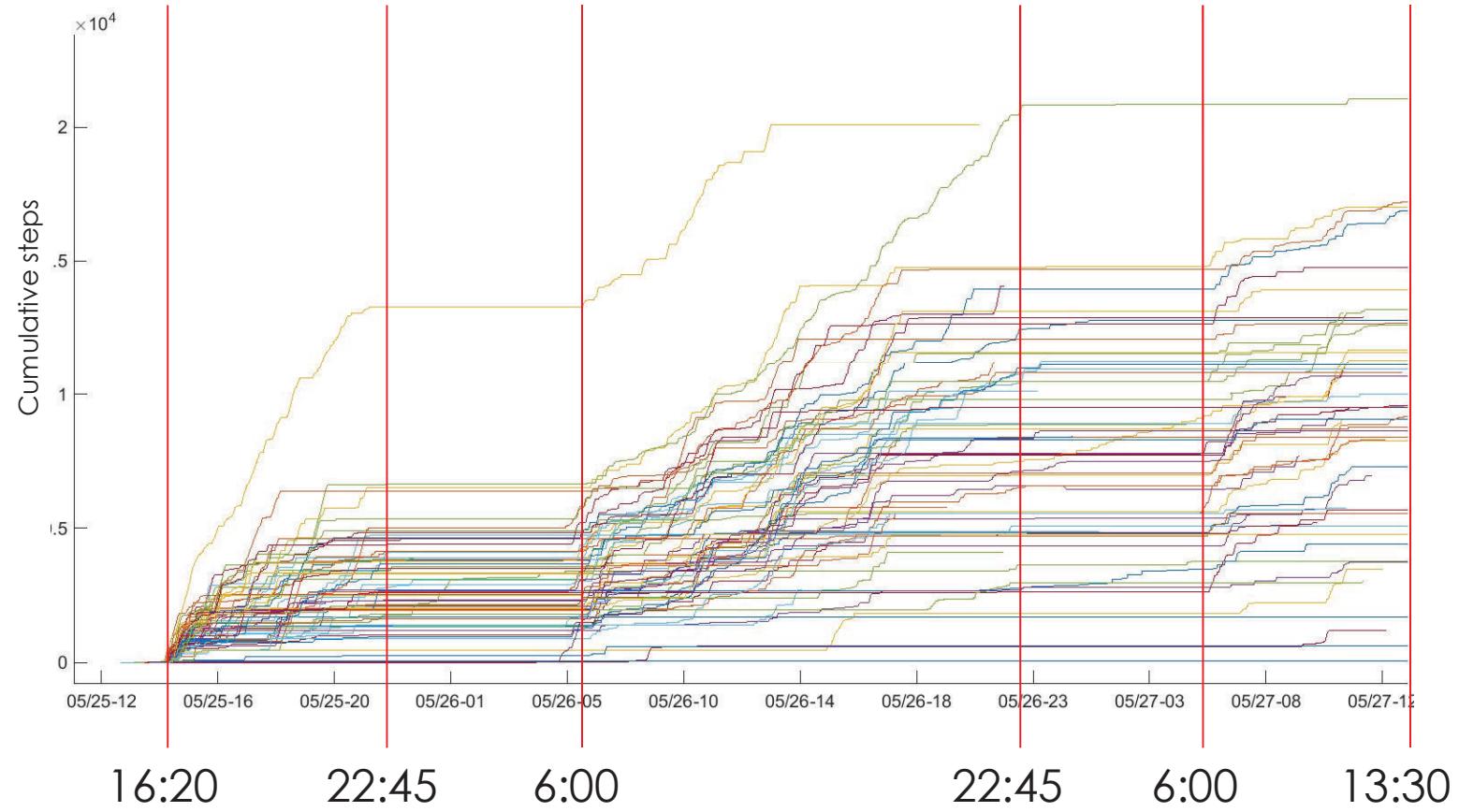


Do students live close to school ?

Primary students tend to live much closer to their schools than secondary/JC students
Over 100 students were observed travelling to Singapore from Johor Bahru

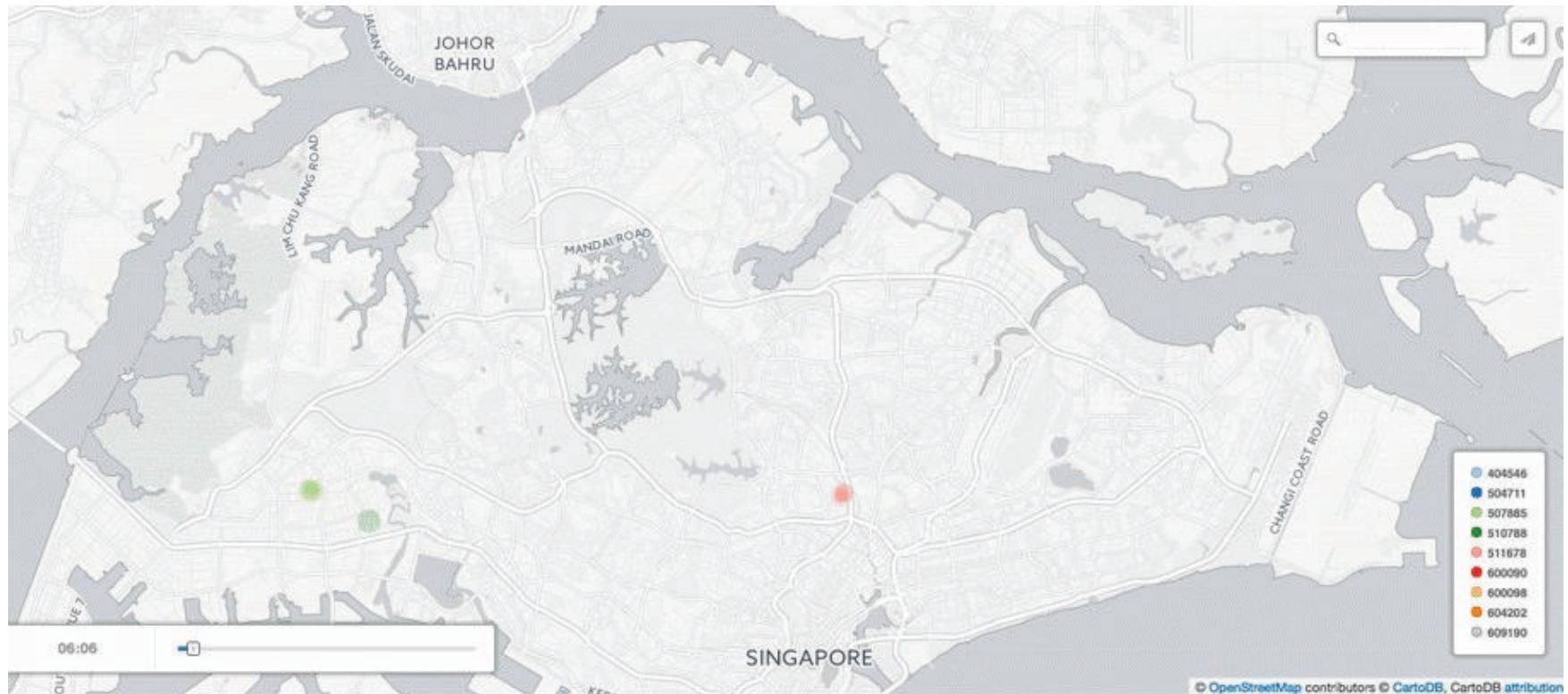


Students' Activity Period Analysis



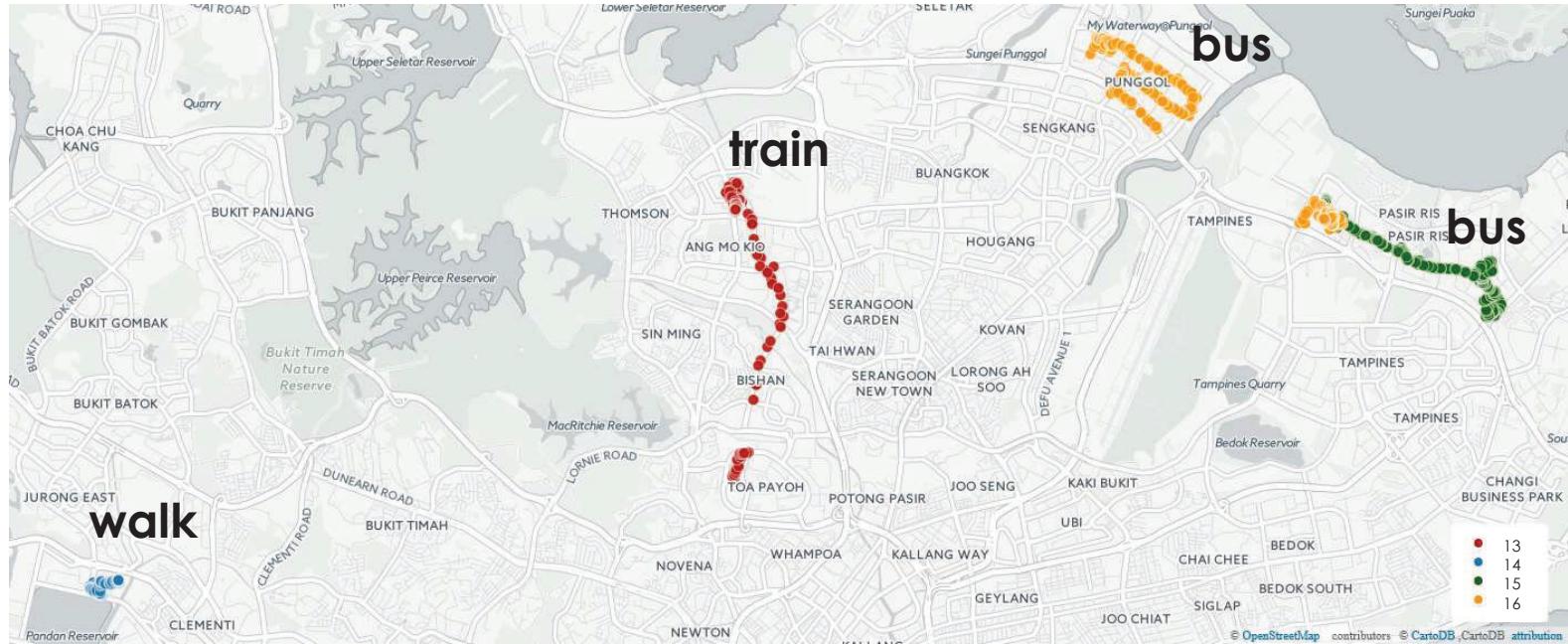
Students are most active after school, as measured by steps

Analysis of Travel Patterns

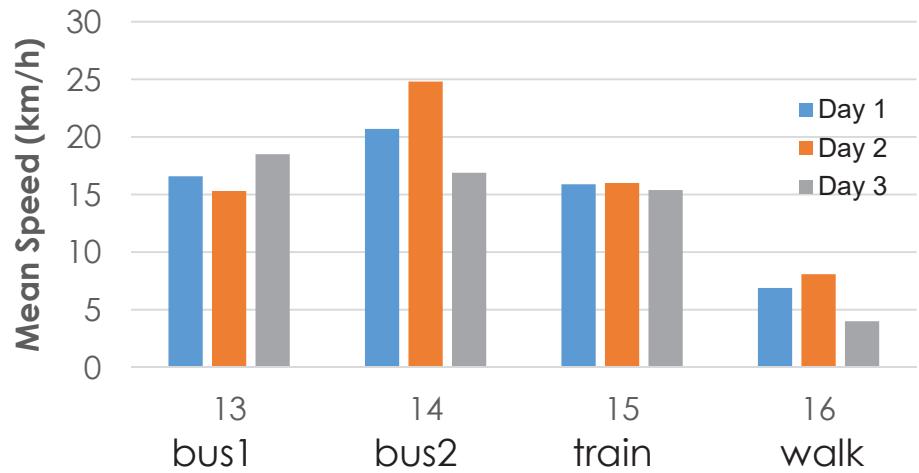


Students travel via car, MRT, bus, and on foot, with most trips starting just past 6AM and ending before 7:30AM.

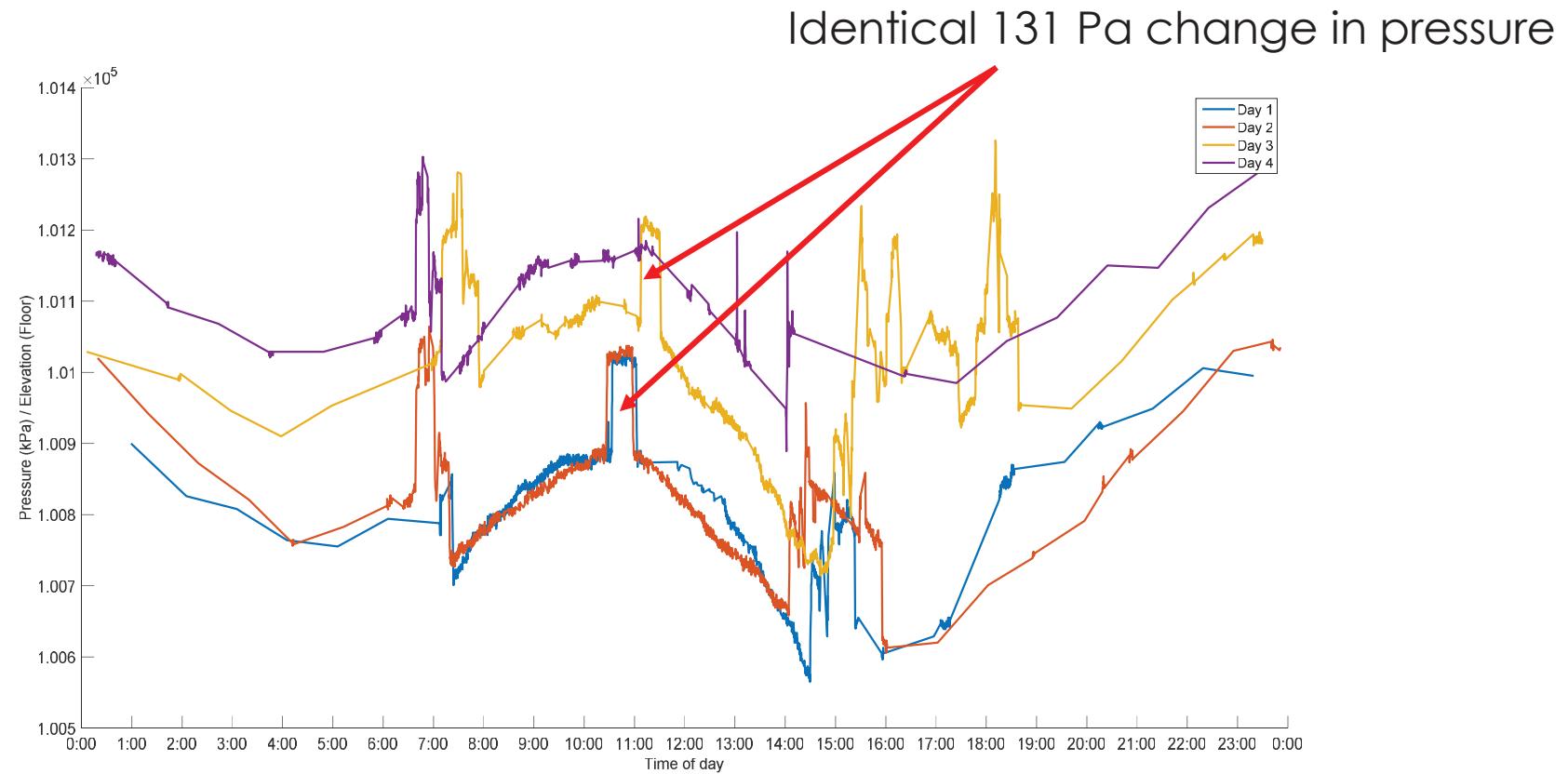
Analysis of Time Spent Commuting



Bus commutes tend to have more unpredictable durations compared with train commutes, as can be expected.

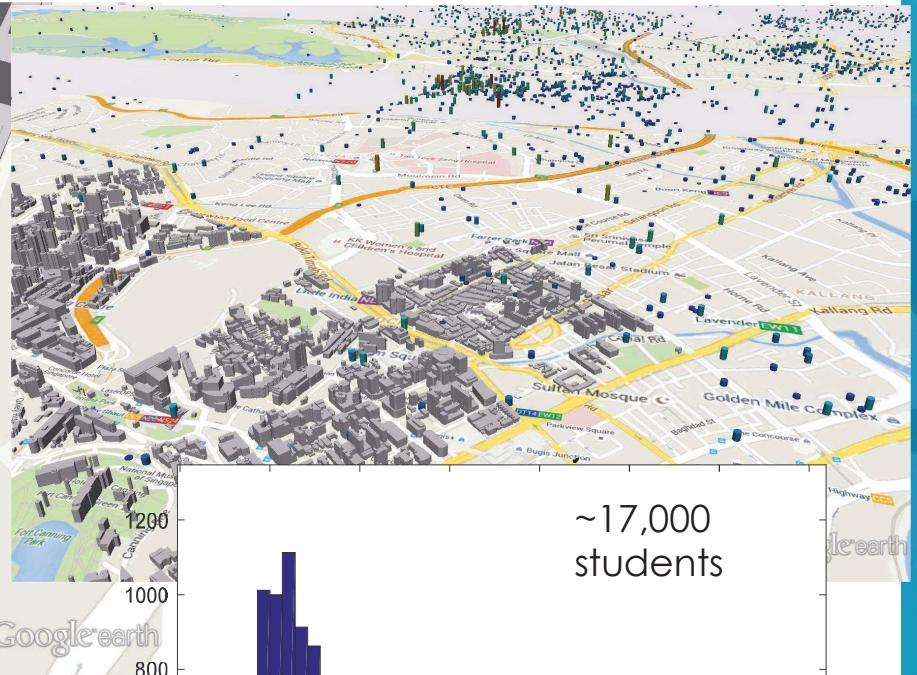
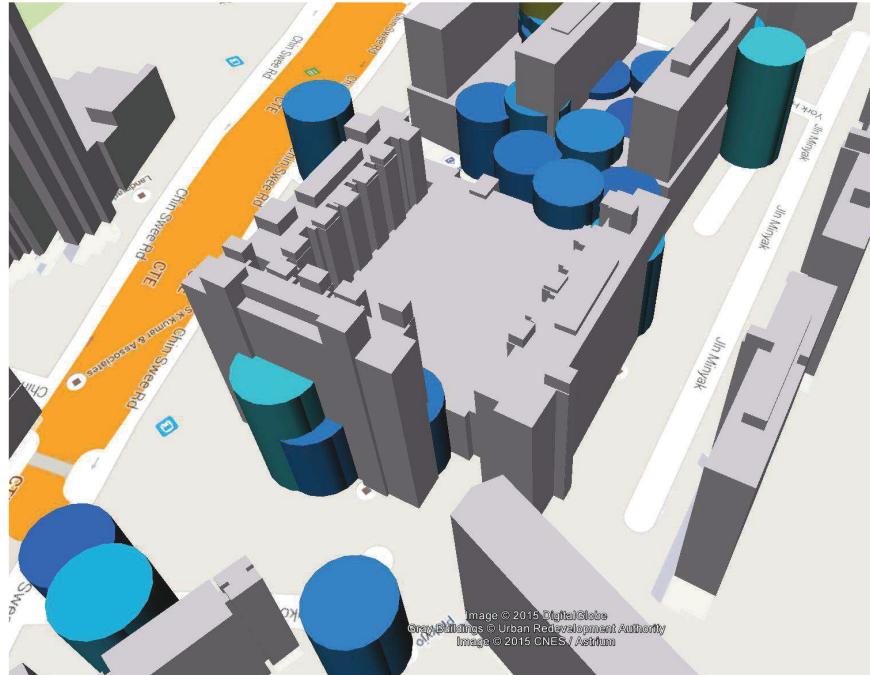


My Pressure



Pressure change between 10:30-11:00AM indicates a 4 story trip up and down, which is likely in an elevator based on rate.

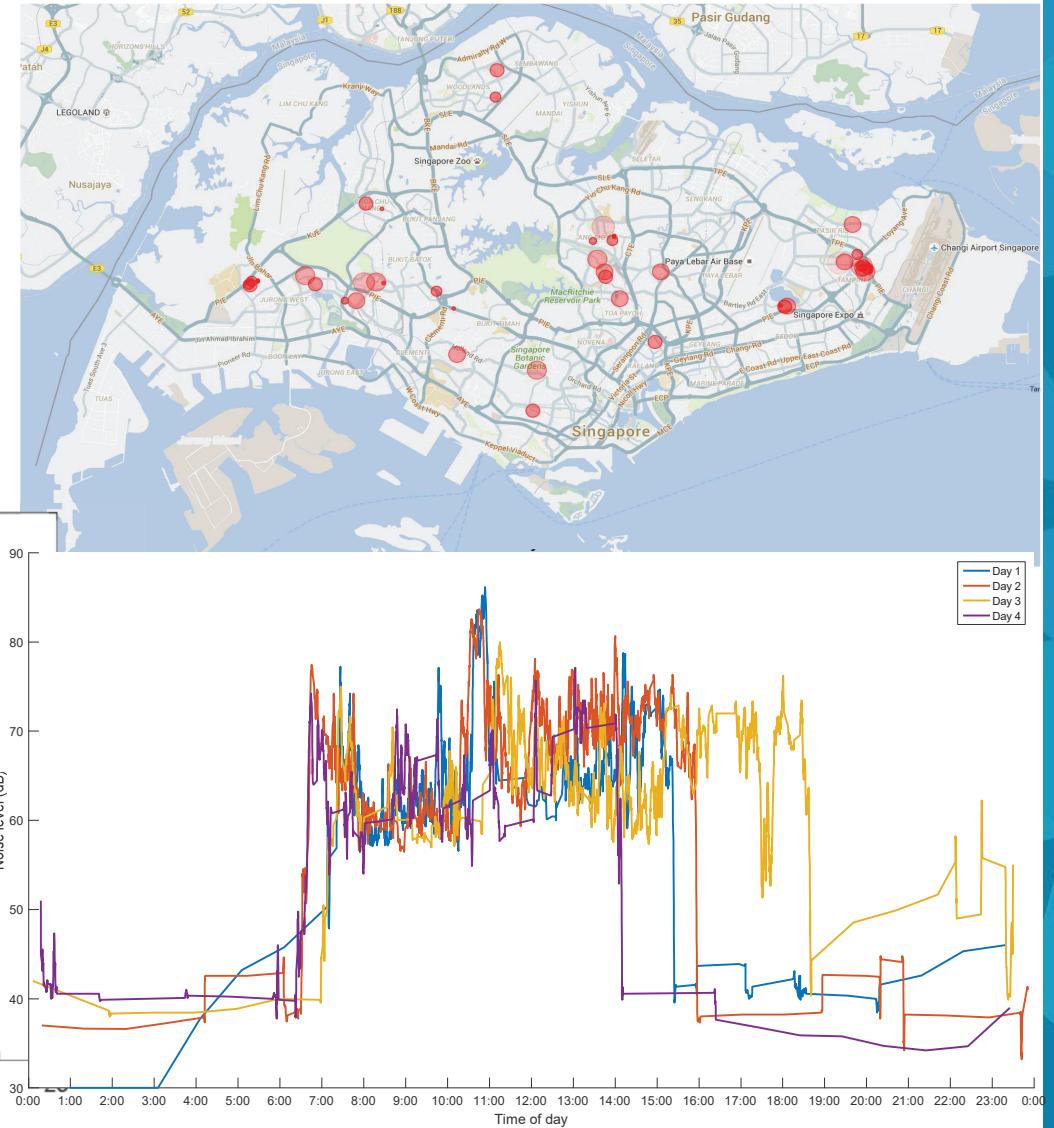
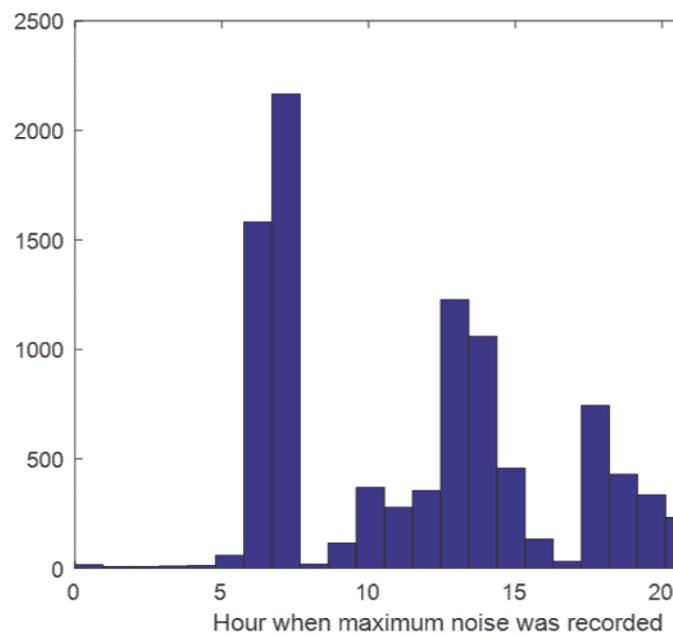
Unit Floor Analysis



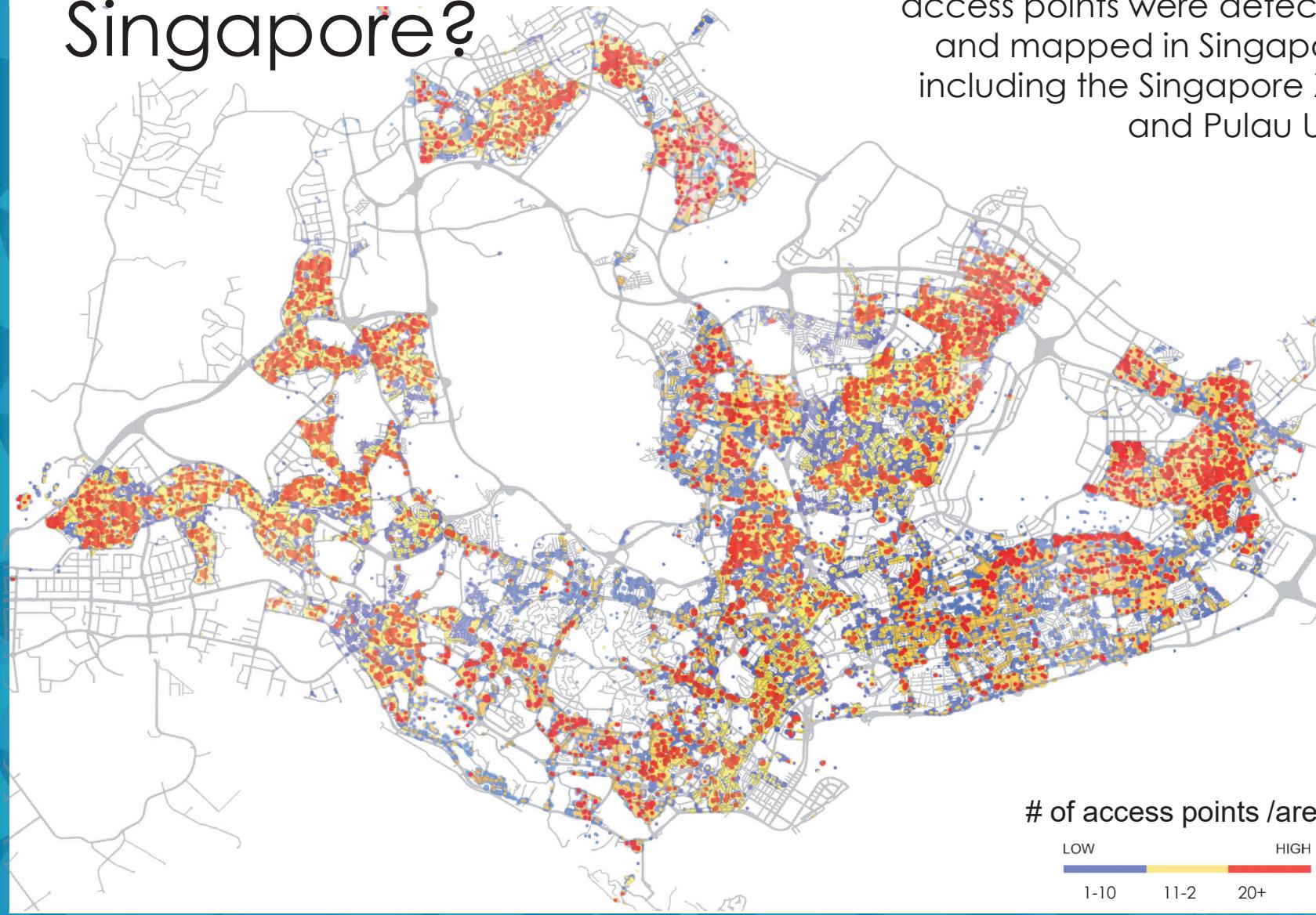
- Students typically live between 4-8th floor
- Some good correspondence between 3D models noted, sometimes elevations disagree with 3D Models

When are students noisiest?

- The loudest noises are measured before students reach school, and after they are dismissed
- There is a near-universal lull in noise in the early afternoon (studying? resting?)



How connected is Singapore?



Over 1.8 million unique Wi-Fi access points were detected and mapped in Singapore; including the Singapore Zoo and Pulau Ubin

Unique Analysis per School



SIDE 1 OF 41 ENGLISH (SINGAPORE)

Distributed 41 slides of custom data analysis for 128 schools.

NATIONAL SCIENCE EXPERIMENT

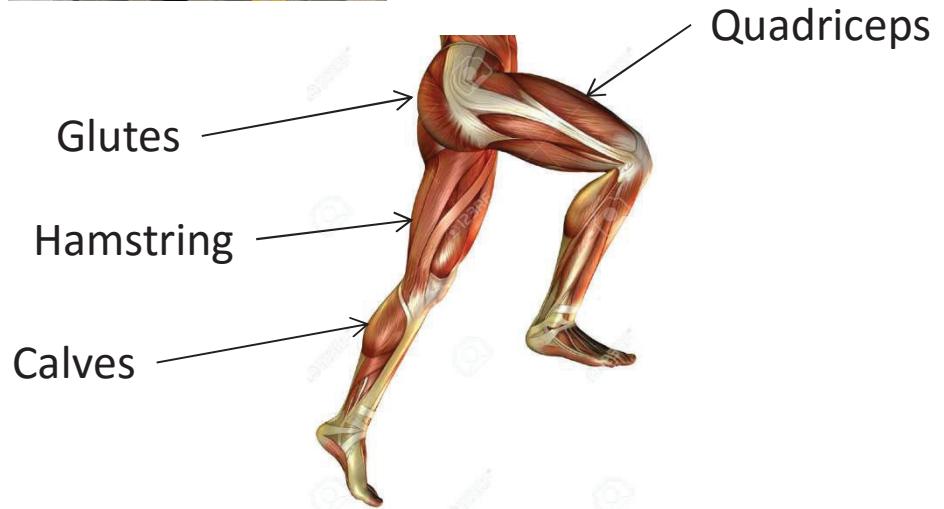
2016

NSE 2016 – Activity 1

- How many stairs climbed per day?

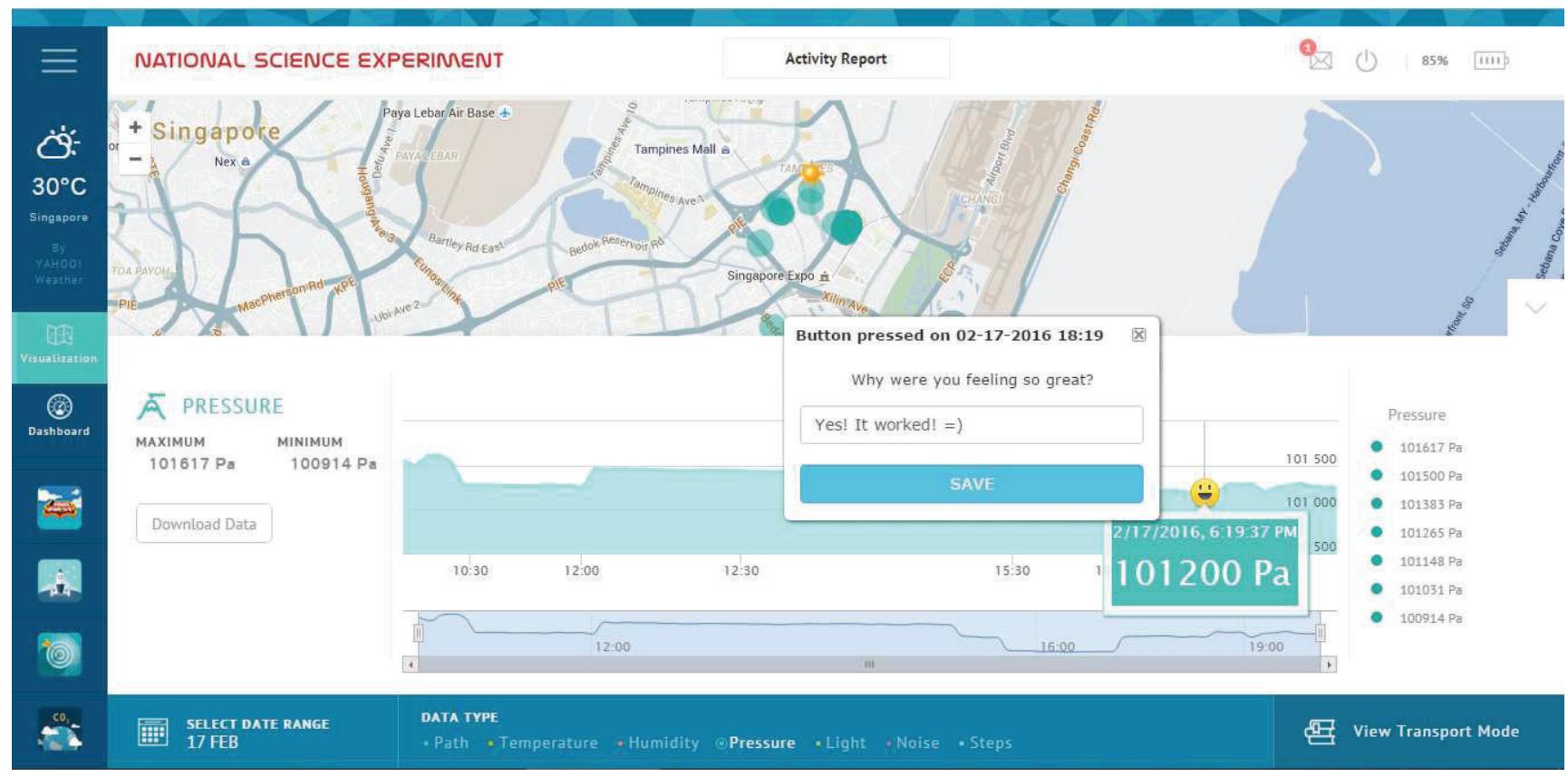
Learning points

- ✓ *The benefits of stair climbing*
- ✓ *The muscle groups involved*
- ✓ *How the SENSG counts the number of stairs climbed*



NSE 2016 – Activity 2

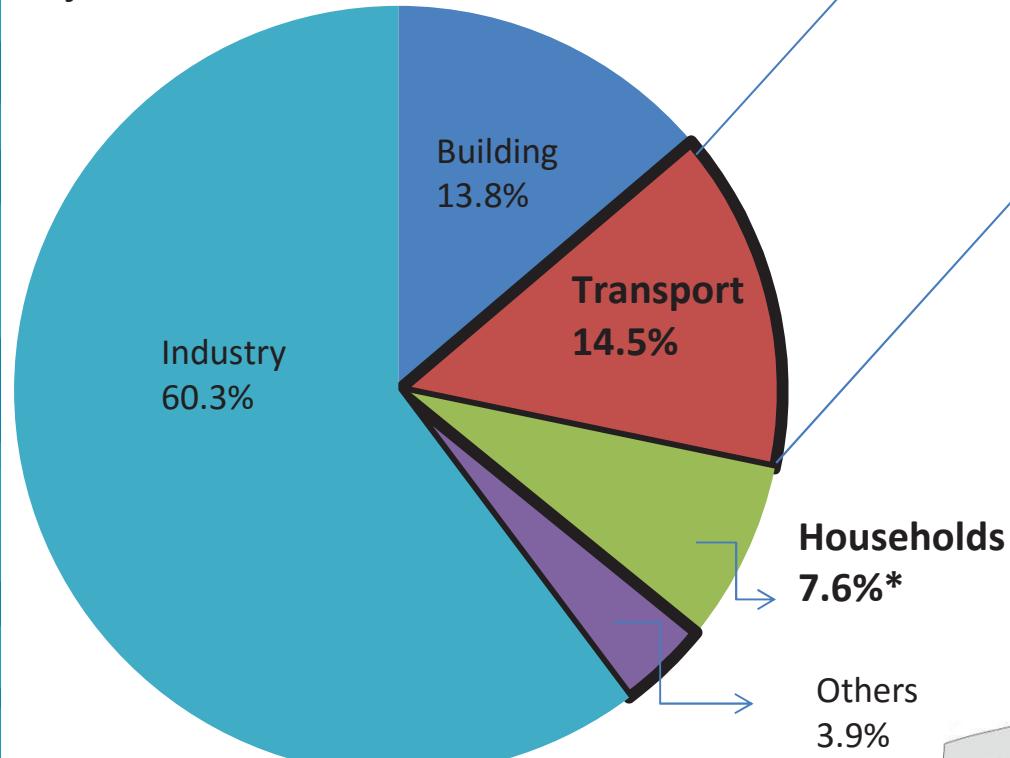
- Geo-tagged mood blogging



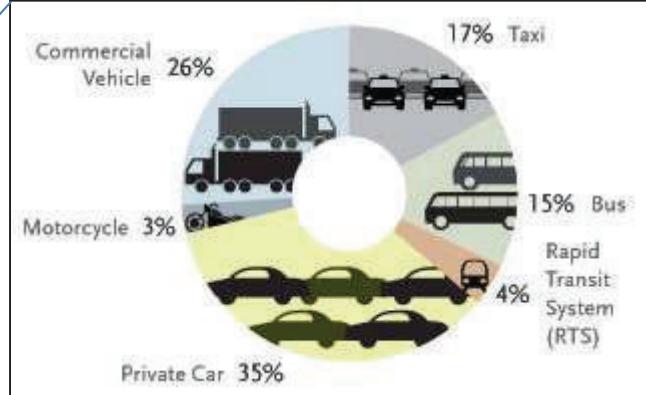
NSE 2016 – Activity 3

- How much CO₂ per day?

Projected 2020 Greenhouse Gas Emissions



*In a typical household, air-conditioning and refrigeration account for the lion's share of electricity consumption.

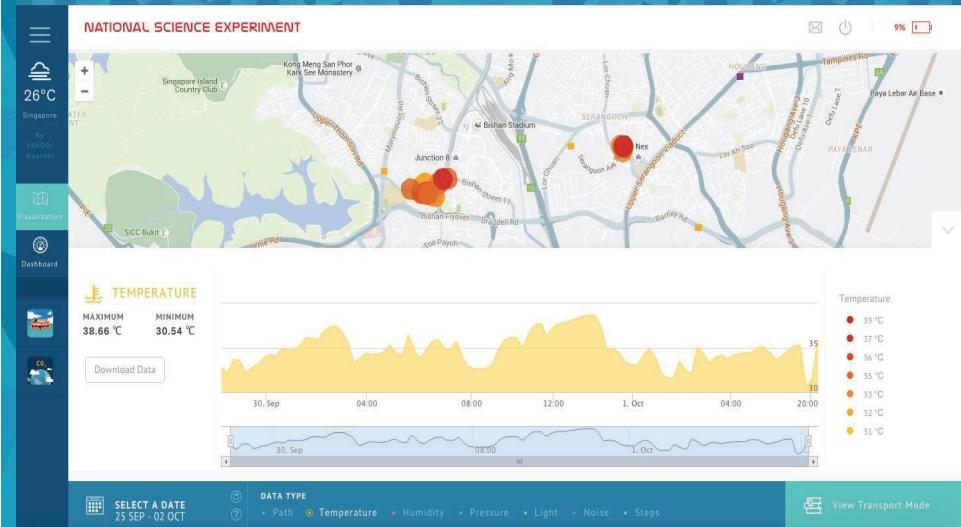


Learning points:

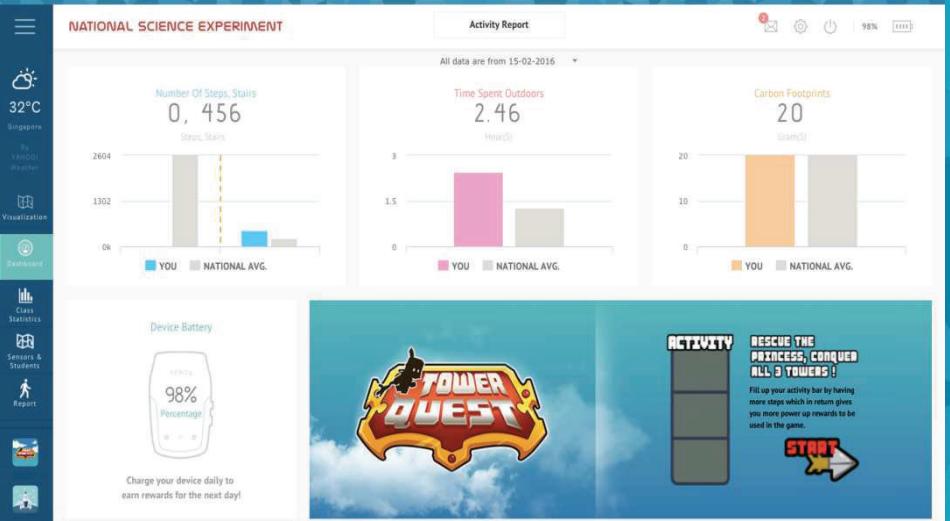
- ✓ What is carbon footprint?
- ✓ How to reduce carbon footprint?
- ✓ How the SENSG device estimates the carbon footprint?

NSE Web Portal

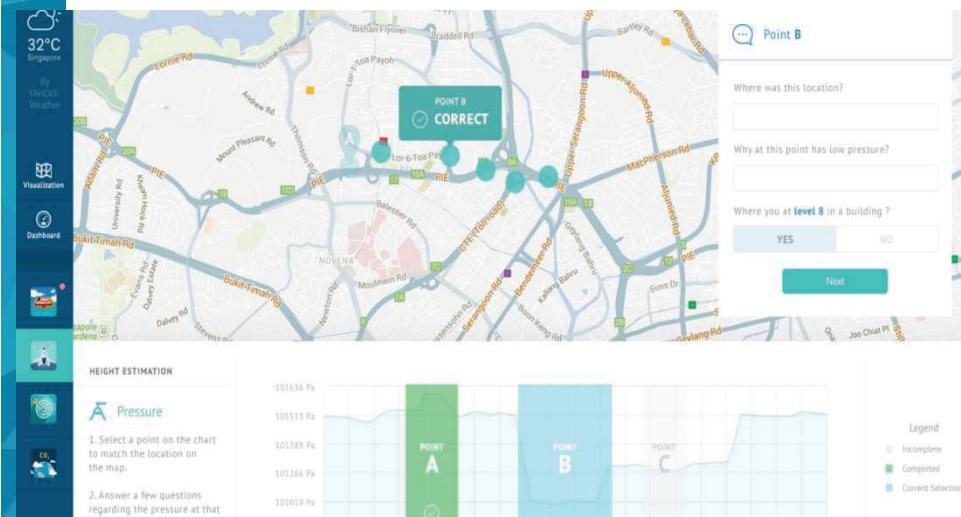
View individual data tagged to locations



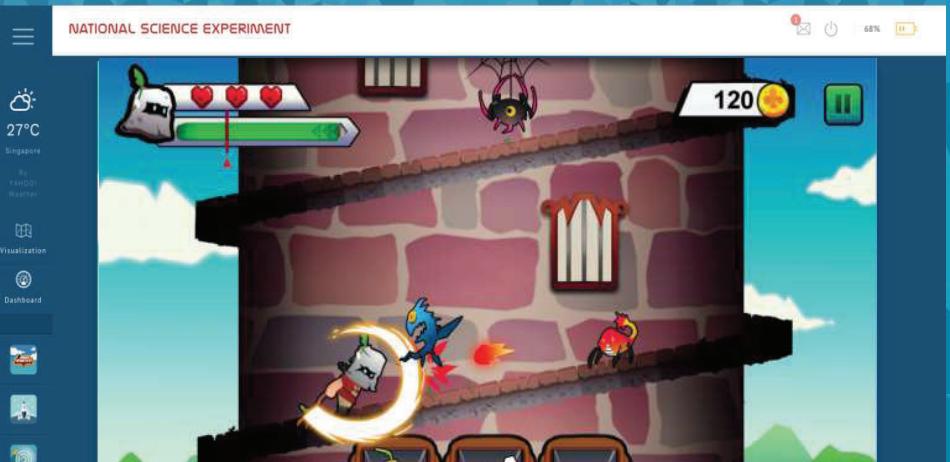
Compare against the national average



Educational modules



Game linked to step count and charging patterns from NSE



Learning modules

1. Data diary – Mode, Median, Standard deviation
2. Height Hunt – Height & pressure correlation
3. CO₂ footprint – Travel mode & CO₂ footprint correlation

The screenshot shows the 'Activity Report' section of the application. It displays a progress bar at the top indicating completion levels for Beginner, Good, Perfect, and Awesome. Below the bar, there are three metrics with corresponding progress bars: 'Data points analysed' (117), 'Activities done correctly' (33%), and 'Extra: Help-modules read' (40%). A table below tracks activity history:

DATE	ACTIVITY	RESULT	DATA POINTS	HELP MODULES
-	Height Hunt	Incomplete	57	1
-	Data Diary	Incomplete	32	3
15/1/2016	CO ₂ Footprint	Completed	28	0

A map of Singapore is visible in the background, with a green dot indicating the user's location near Changi Airport. A sidebar on the left provides navigation links for 'National Science Experiment', 'Visualisation', 'Dashboard', 'Data Diary', and 'Helpful Information'.

Activity report

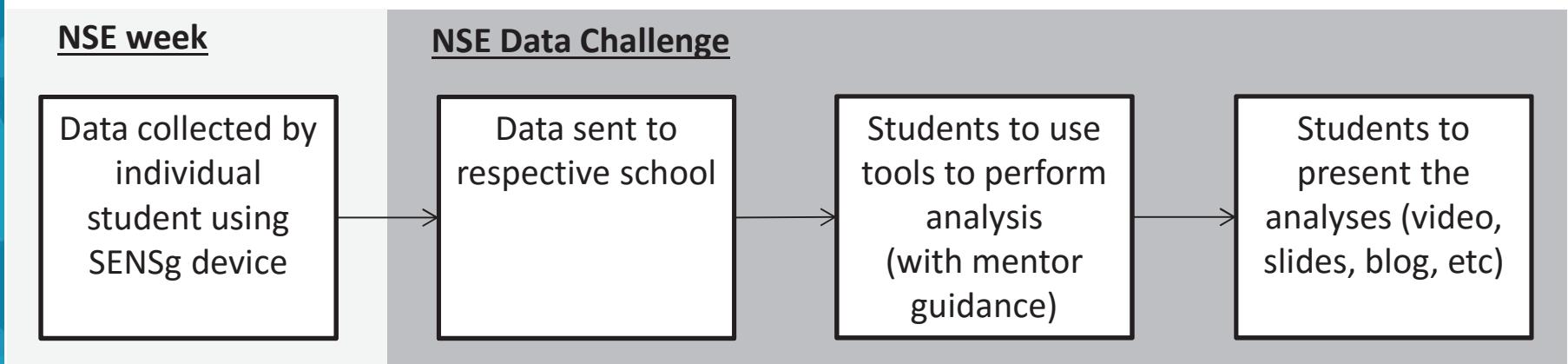
The screenshot shows the 'Activity Report' section with a large yellow padlock icon in the center, indicating that education modules must be completed to unlock the game. Below the padlock, there are two small icons: a coffee cup and a target. The sidebar on the left includes 'National Science Experiment', 'Visualisation', 'Dashboard', 'Data Diary', and 'Helpful Information'.

Complete education modules to unlock game!

NSE Data Challenge

Objectives:

1. To educate students on big data and “Internet of Things”
2. To familiarize students with the use of big data tools and analytics



Criteria:

- Open to Secondary 3 – Junior College 2 students
- 3-4 members/team
- Up to 3 submissions per school (1 entry/team)

NSE Data Challenge - Sample analysis

- The furthest distance from school
- The major choke points in the school vicinity
- Places where students spend their time before school, during recess and after school
- The distribution of students reaching and leaving school at different time interval

Timeline

<i>Events</i>	<i>Dates</i>
Pilot test	29 Feb - (Canossa Convent Primary School & Nanyang Junior College)
Full scale experiment	Monday - Thursday 1) 11-14 Apr 2) 18-21 Apr 3) 16-19 May 4) 11-14 Jul 5) 18-21 Jul
Workshops	Nov/Dec 2016
Big Data Visuals & NSE Data Challenge	January 2017 (Details TBC)

HOW TO SIGN UP FOR NSE 2016

Step 1: Register Online

Email with signup address sent to schools

- Click, fill, submit

The screenshot shows a web page titled "NSE 2016: Confirmation Form". At the top, there is a navigation bar with icons for search, refresh, and user profile. Below the title, a note states: "This form has to be submitted by 25th of March 2016. You will need to have all the information ready in order to fill and submit this form. You may email NSE@science.edu.sg if you have any questions. Main Coordinator will be the Main Contact Person for clarification of details for the National Science Experiment. Note that participating schools may be mentioned in NSE publicity materials in the media." Under "School Type", there are three radio buttons: Primary (selected), Secondary, and Junior College. The "School Name" field is a text input box. The "Address" field is a large text input box. The "Main Coordinator" field is a text input box. In the bottom right corner of the page, there is a watermark for "Activate Windows Go to Settings to activate".

NSE 2016: Confirmation Form

- This form has to be submitted by 25th of March 2016
- You will need to have all the information ready in order to fill and submit this form.
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School Type

Primary Secondary Junior College

School Name

Address

Main Coordinator

Activate Windows
Go to Settings to activate

Dateline

When must I submit?

<i>Session</i>	<i>Dateline</i>
Apr 2 nd week (11-14 Apr)	25 Mar
Apr 3 rd week (18-21 Apr)	25 Mar
May 3 rd week (16-19 May)	22 Apr
Jul 2 nd week (11-14 Jul)	27 May
Jul 3 rd week (18-21 Jul)	27 May

Step 2: Informed Consent (1/2)

2 consents are required

- Parental consent
 - To consent to their child/ward taking part
- User (student) assent
 - To assent to having the data they collected used by scientists

Step 2: Informed Consent (2/2)



Version 2: 06 September 2013
IRB-TEMPLATE-001

Participant Information Sheet (For Parent / Guardian)

1. Project title
NATIONAL SCIENCE EXPERIMENT

2. Principal Investigator and co-investigator(s), if any, with the contact number and organization.

PRINCIPAL INVESTIGATOR:

Dr Erik Wilhelm
Assistant Professor
Engineering Product Development (EPD)
Singapore University of Technology and Design (SUTD) Tel: +65 6499 4606

STUDY SITES:

All the Primary Schools, Secondary Schools and Junior Colleges in Singapore

CO-INVESTIGATORS

Dr Nils Tippenhauer	Assistant Professor	ISTD/SUTD
Dr Shaohui Foong	Assistant Professor	EPD/SUTD
Dr Suranga Nanayakkara	Assistant Professor	EPD/SUTD
Dr Soh Gim Song	Assistant Professor	EPD/SUTD
Dr Tan U-Xuan	Assistant Professor	EPD/SUTD
Dr Mohan Elara	Lecturer	EPD/SUTD

COLLABORATORS:

Ms Priji Balakrishnan	PhD Candidate	ASD/SUTD
Dr Hyungkyoo Kim	Research Fellow	CIC/SUTD
Mr Clarence Sirisena	Asst Chief Executive	Science Center
Mr Eugene Wambeck	Senior Manager	Science Center
Mr Saminathan Gopal	STEM Inc	Science Center
Dr Alessandro Romagnoli	Assistant Professor	ME/NTU
Dr Michel Cardin	Assistant Professor	ISE/NUS

Consent For Parent / Guardian

Page 1:

Participant Information Sheet [Click to view]

Consent

I understand that

- a. I have read the participant information sheet (PIS) and understood the nature of the study.
- b. My decision for my child/ward* to participate in this NATIONAL SCIENCE EXPERIMENT is voluntary and completely up to me.
- c. My child/ward* can also withdraw from the data collection at any time without giving any reasons, by informing the principal investigator and all his/her data collected will be discarded.
- d. Taking part in this project is anonymous. My child/ward* do not have to provide any personal identifiers.
- e. This information will be exclusively used for academic research. This research does not have any commercial motivation.

Please indicate if you are agreeable for my child/ward* to participate in this NATIONAL

Step 3: Delivery

The week **before the experiment**

SENSg Devices delivered to schools.

1 Box



=



+

Password list

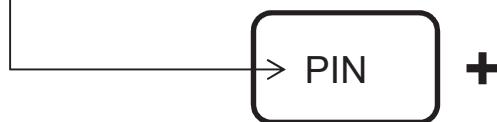
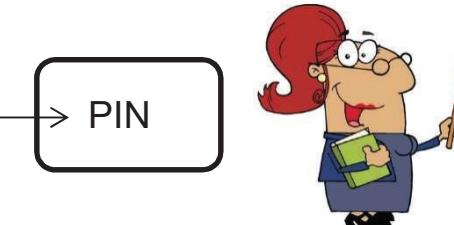
S/N	Passwords
Device1	PIN PIN

Step 4: Distribute

The week of the experiment

On Monday, teachers distribute SENSG devices and PINs to students

<u>Password list</u>	
S/N	Passwords
Device1	<div style="display: flex; justify-content: space-around;"><div style="border: 1px solid black; padding: 5px;">PIN</div><div style="border: 1px solid black; padding: 5px;">PIN</div></div>



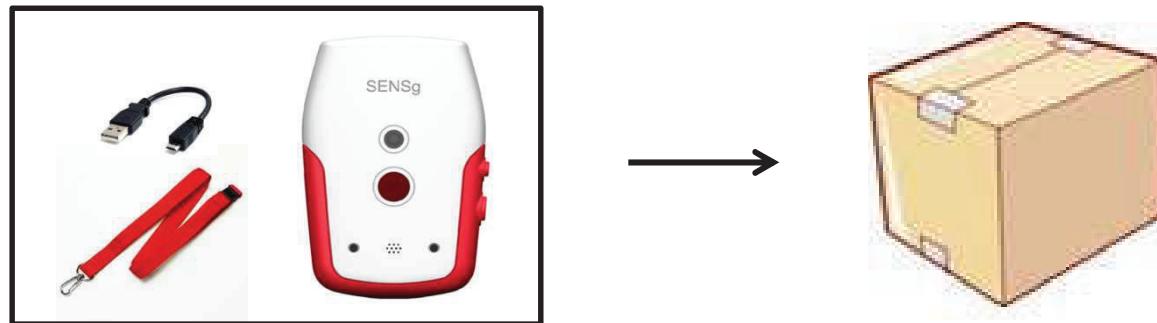
Students need the device ID and Pin to view their own set of data in the webapp: app.nse.sg/app



Step 5: Collect & Return

The week of the experiment

On **Friday**, teachers collect SENSG devices and put back into box with the **signed consent forms**.



The week **after** the experiment

On **Tuesday**, boxes collected from schools by courier.

Mail us:
Queries to NSE

NSE@science.edu.sg

CURRICULUM PACKAGE

SHARING SESSION (HONG KAH SECONDARY)

THANK YOU